A Risk Informed Approach to Reliability Requirements Tailoring

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Recipe for Success

- Jet Propulsion Laboratory
  - Design Principles
  - Flight Project Practices

Jet Propulsion Laboratory

- Design Principles
  - Specifies essential attributes of JPL space flight systems including aspects related to their design, verification/validation, and operation
    - Robust design margins for high reliability
    - Ample margins for management of development risk
    - Comprehensive approach to flight system verification and validation, and conservative use of flight assets
  - The design principles do not attempt to represent the only design approach, rather specify the limits of risk-taking the institution is willing to accept

Jet Propulsion Laboratory

- Flight Project Practices
  - Provides a common understanding of and reference for the way JPL develops and operates our flight projects
    - Establish standards of uniformity, where standardization is judged to have significant benefit
    - Capture the approaches and methods important to sponsors
    - Incorporate lessons learned that were key to past successes
  - Includes Safety & Mission Assurance Practices
    - Reliability Engineering
      - …consists of the set of well-defined closed-loop activities performed over the life of a flight project to ensure mission success

Today's Environment

- Competitive

- Limited Funding

- Results
  - Recipes for Success being Challenged
  - Additional risks accepted

What Can You Do?

- Risk Informed Decision Making (RIDM)
  - The institutional requirements are tailored for a specific project
    - Project Constraints
    - Mission Characteristics
    - Design Characteristics for specific hardware items
  - Departures from the institutional requirements
    - Are assessed for potential implementation and mission risks
    - Identified potential risks are communicated/documented

Risk Informed Decision Making

- Where to Begin
  - Begins during Phases A/B; Project Formulation
    - Well before Phases C/D; Project Implementation
  - Continues throughout the Project Life Cycle
  - First Round of Tailoring
    - Occurs when project & line organizations negotiate project-specific requirements, schedules, & other aspects of project implementation
    - Tailoring results are documented in requirements documents, work agreements, and waivers.
    - Waivers document
      - Exceptions to requirements
      - Includes MA risk assessment

Risk Informed Decision Making

- For Reliability
  - Subsequent tailoring is often necessary
    - Requirements Changes
    - Design Evolution
    - Hardware Capability
    - Budget/Schedule Constraints
    - Test Failures
    - Various Other Project Nuances
  - Subsequent tailoring needs to be properly documented
  - When project characteristics change, it's important to:
    - Review all prior reliability tailoring
    - Re-evaluate the associated implementation & mission risk

Risk Informed Decision Making

- Key Steps
  - During formulation, work with project personnel to understand the project characteristics
  - Work with project personnel to identify tailoring opportunities & the associated risks
  - Develop project specific requirements & document them
  - Review & get approval from Line/Project management
  - Document the exceptions to the baseline/institutional requirements & the associated residual risks
  - Throughout project development, work with project personnel to understand new/changing project requirements, characteristics, & constraints

Risk Informed Decision Making

- Key Steps (continued)
  - Work with project personnel to identify tailoring options to accommodate new developments
  - Review with Line/Project management
  - Document additional changes & residual risks

Conclusion

- Prior to RIDM Tailoring Approach
  - Reliability programs were developed based upon a ranking of the requirements
  - Exceptions were taken to the lowest ranked requirement across all the hardware elements of a given project until the cost target was met
  - How a specific requirement might impact a hardware item during a critical mission phase, or if the hardware item was heritage, or a new design, were not taken into consideration

Conclusion (continued)

- RIDM Tailoring Approach Advantage
  - Brings project & reliability personnel together to engage in discussions with regards to reliability requirements & potential risks, project implementation & mission, early in the development life cycle
  - Both project & reliability personnel reach mutual agreements with regards to reliability requirements tailoring and the associated risks as the project moves forward towards the implementation phase

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